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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/678,354

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EXAMINER

VAN ROY, TOD THOMAS

ART UNIT

PAPER NUMBER

2828

MAIL DATE

DELIVERY MODE

04/30/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/678,354

Applicant(s)

ARMANI ET AL.

Examiner

Tod T. Van Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04/17/2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10-22, 28-41, 43-58, 60-62 and 67-82 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-22, 28-41, 43-58, 60-62 and 67-82 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) ☐ Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments, see Remarks, filed 04/17/2007, with respect to the rejections over Maleki have been fully considered and are persuasive. The rejection of the claims has been withdrawn.

The examiner notes the filing of an affidavit disclosing common ownership of the cited prior art and the instant invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-8, 10-18, 22, 28-41, 43-47, 49-58, 62, 67, and 81-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall (US 5343490) in view of Stone et al. (US 6259717).

With respect to claims 1, 2, 8, and 10, McCall teaches a micro-cavity resonator (70) being substantially parallel to a top surface of the pillar, comprising: a micro-cavity, a substrate portion (73) located below the micro-cavity forming a pillar (73), the pillar supporting the ultra-high Q micro-cavity, whereby optical energy travels along an inner surface of the micro-cavity (col.7 lines 18-50, fig.7). McCall does not teach the Q value to be at least 1×10^8 . Stone teaches a micro-cavity optical resonator wherein it is taught that disc shaped micro-resonators (such as that taught by McCall) can have Q factors exceeding 10^{10} (fig.5). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the resonator of McCall with the high Q teaching of Stone in order to allow optical energy to circulate in the resonator with a long photon lifetime and incur low losses.

With respect to claim 3, McCall teaches the micro-resonator of claim 1, including the resonator to be formed of silica (col.6 lines 58-68)

With respect to claim 4, McCall teaches the micro-cavity to be substantially circular and to have a diameter of about 10um (col.7 line 38).

With respect to claims 5-6, McCall teaches a toroid shaped micro-cavity having a thickness of about 5um (4um, col.8 line 39, fig.4).

With respect to claim 7, McCall teaches the use of an elliptical shape (col.9 line 64).

With respect to claim 11, McCall and Maleki teach the resonator as outlined in the rejection to claim 1, and McCall further teaches a 10um diameter (col.7 line 38).

With respect to claims 12, 14, 18, and 28, McCall and Maleki teach the resonator outlined in the rejection to claim 1, but do not teach the use of a silicon substrate. Silicon substrates are materials known in the art to be used with resonator devices. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the resonator of these known materials, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

With respect to claim 13, McCall teaches a resonant mode within the resonator comprising a whispering-gallery mode (WGM) (col.6 line 30).

Claims 15-17 are rejected for the same reasons as claim 1. These claims merely detail the methods of forming the device. The method of forming a device is not germane to the patentability of the device itself, therefore these limitations are not given patentable weight. At best these claims could be characterized as product-by-process claims, where the process limitations are not limiting, only the structure implied by the process. See MPEP 2113. Here, the structure implied by the process steps is merely the structure of claim 1.

With respect to claim 22, McCall further teaches an optically active component within the cavity (col.5 lines 1-3).

With respect to claim 81, McCall and Stone teach the resonator outlined in the rejection to claim 1 above, and McCall further teaches reduction of the surface roughness (col.10 lines 10-15), but does not teach the roughness to be less than

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several nanometers. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the surface roughness to less than several nanometers as an optimization through routine experimentation (see MPEP 2144.05 II A).

With respect to claims 29, 34, 37, and 43, McCall teaches a high Q micro-cavity resonator comprising a toroid shape and an optical material (inherently meltable, and inherently adhered to itself), and a substrate that supports the optical material wherein optical energy travels along an inner surface of the resonator (col.7 lines 27-68, fig.7). McCall does not teach the Q value to be at least 1×10^8 . Stone teaches a micro-cavity optical resonator wherein it is taught that disc shaped micro-resonators (such as that taught by McCall) can have Q factors exceeding 10^{10} (fig.5). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the resonator of McCall with the high Q teaching of Stone in order to allow optical energy to circulate in the resonator with a long photon lifetime and incur low losses.

Claims 30 and 35 are rejected for the same reasons outlined in the rejection to claim 3 above.

Claims 31, 46, and 58 are rejected for the same reasons outlined in the rejections to claims 12, 14, 18, and 28 above.

Claims 32-33, and 49-57 are rejected for the same reasons as claim 29. These claims merely detail the methods of forming the device. The method of forming a device is not germane to the patentability of the device itself, therefore these limitations are not given patentable weight. At best these claims could be characterized as product-by-process claims, where the process limitations are not limiting, only the structure implied

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by the process. See MPEP 2113. Here, the structure implied by the process steps is merely the structure of claim 29.

Claim 36 is rejected for the same reasons outlined in the rejection to claim 4 above.

Claim 38 is rejected for the same reasons outlined in the rejection to claim 6 above.

Claim 39 is rejected for the same reasons outlined in the rejection to claim 7 above.

With respect to claim 40, McCall further teaches the cavity to be substantially parallel to a top surface of the pillar (fig.7).

With respect to claim 41, it is inherent that the size of the cavity is limited by the size of the top portion of the pillar, as a small pillar would not physically support too large a resonator.

With respect to claim 44, McCall further teaches the micro-cavity to be substantially circular and to have a diameter of about 10um (col.7 line 38).

Claim 45 is rejected for the same reasons outlined in the rejection to claim 13 above.

With respect to claim 47, McCall further teaches the substrate is in the form of a pillar.

Claim 62 is rejected for the same reason outlined in the rejection to claim 22 above.

Claim 67 is rejected for the same reasons given in the rejections to claims 29 and 58 above. *The examiner notes the forming the pillar via isotropically etching the substrate would be considered a non-limiting product by process limitation.*

Claim 82 is rejected for the same reason outlined in the rejection to claim 81 above.

Claims 19 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall and Stone and further in view of Gayral ("High-Q Wet-etched GaAs Microdisks Containing InAs quantum Boxes").

With respect to claims 19 and 48, McCall and Stone teach the resonators outlined in the rejections to claims 1 and 29, but do not teach the substrate to be tapered. Gayral teaches a tapered substrate (pg.1908). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the resonator of McCall and Stone with the tapered shape of Gayral in order to realize low threshold light emitting or lasing devices, and aid in the prevention of oxidation.

Claims 20-21 and 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall and Stone in view of Chu ("Observation of Enhanced Photoluminescence in Erbium-Doped Semiconductor Microdisk Resonator").

With respect to claims 20-21 and 60-61, McCall and Stone teach the resonators outlined in the rejections to claims 1 and 29 above, but do not teach the use of a rare earth dopant. Chu teaches a micro-cavity resonator which uses a rare earth dopant

(pg.2843). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the resonator of McCall and Stone with the dopants of Chu to insure a strong emission.

Claims 78-79 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall in view of Vollmer et al. ("Protein detection by optical shift of a resonant micro-cavity", applicant submitted prior art).

With respect to claims 78-79, McCall teaches the resonators having the structures outlined in the rejections to claims 1 and 29, but does not teach the use of a biotinylated surface. Vollmer teaches micro-cavities using biotinylated surfaces (pg.2 col.2 para.5). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the resonator of McCall with the coating of Vollmer in order to detect biological agents.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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